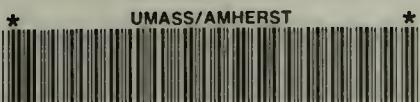


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DEPARTMENT OF ENVIRONMENTAL
QUALITY ENGINEERING
DIVISION OF WATER SUPPLY

GROUNDWATER PROTECTION STRATEGY

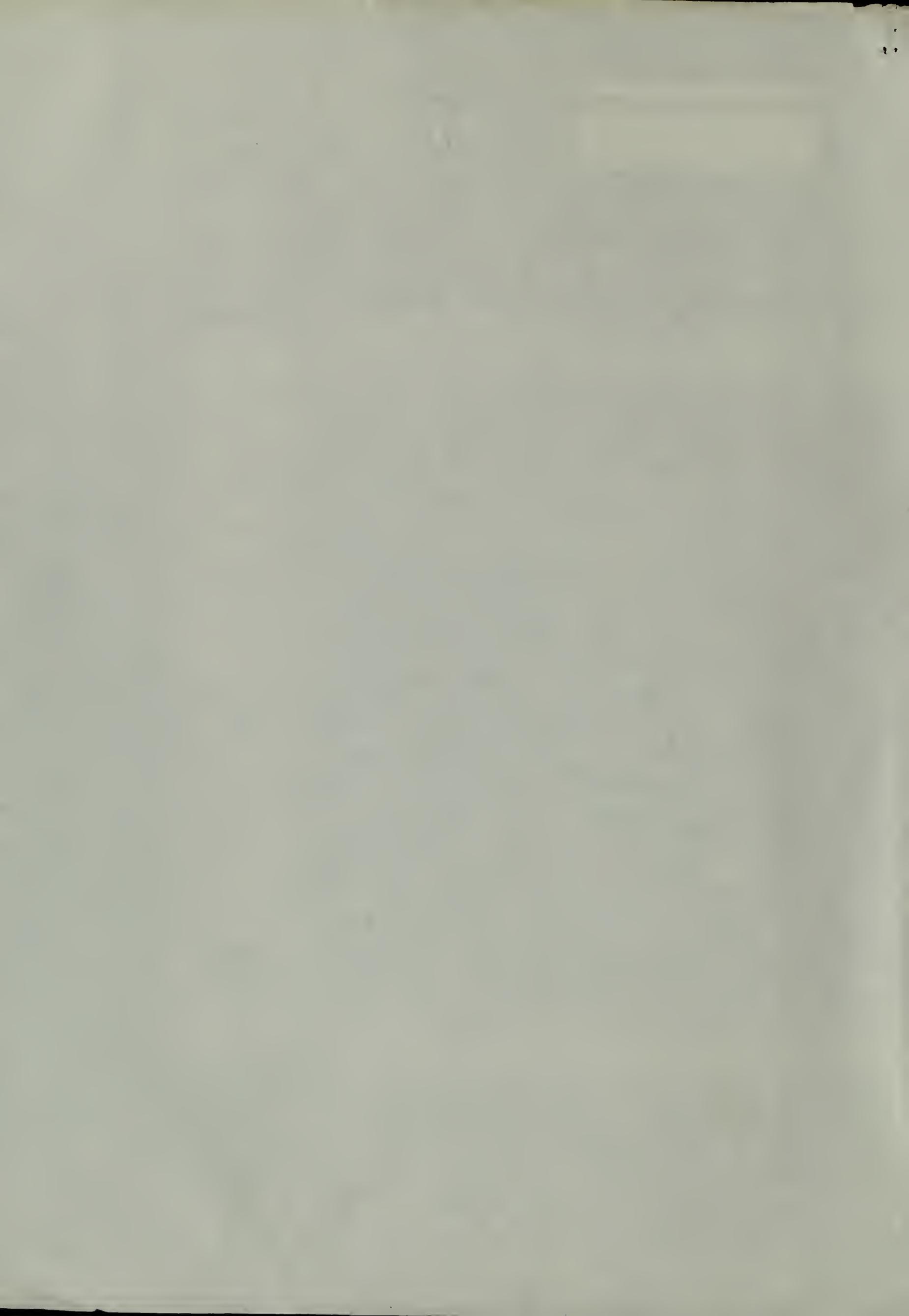
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GROUNDWATER PROTECTION STRATEGY

Commonwealth of Massachusetts
Department of Environmental Quality Engineering
Anthony D. Cortese, Sc.D., Commissioner

January 1983

Prepared by

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Commissioner
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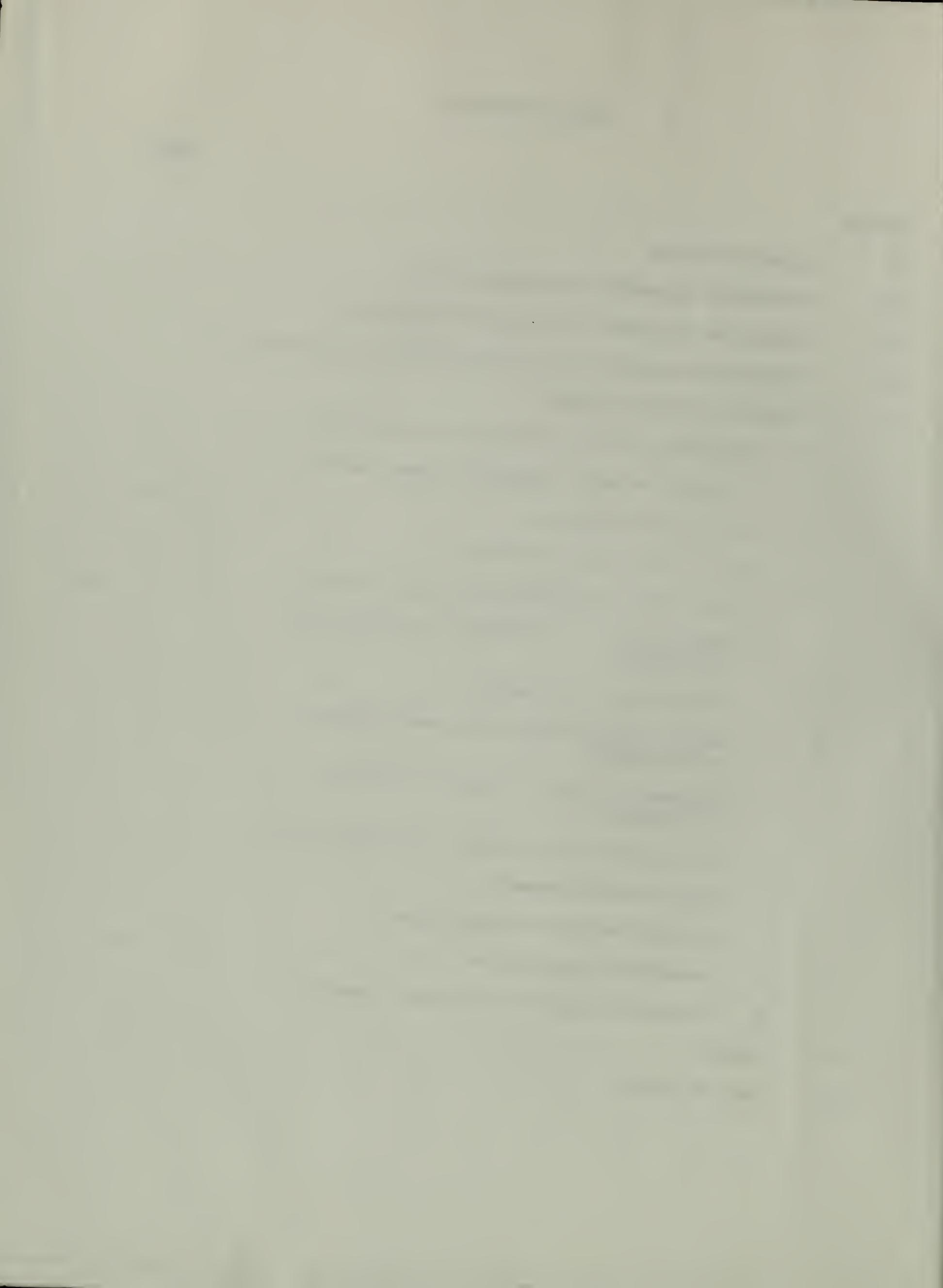
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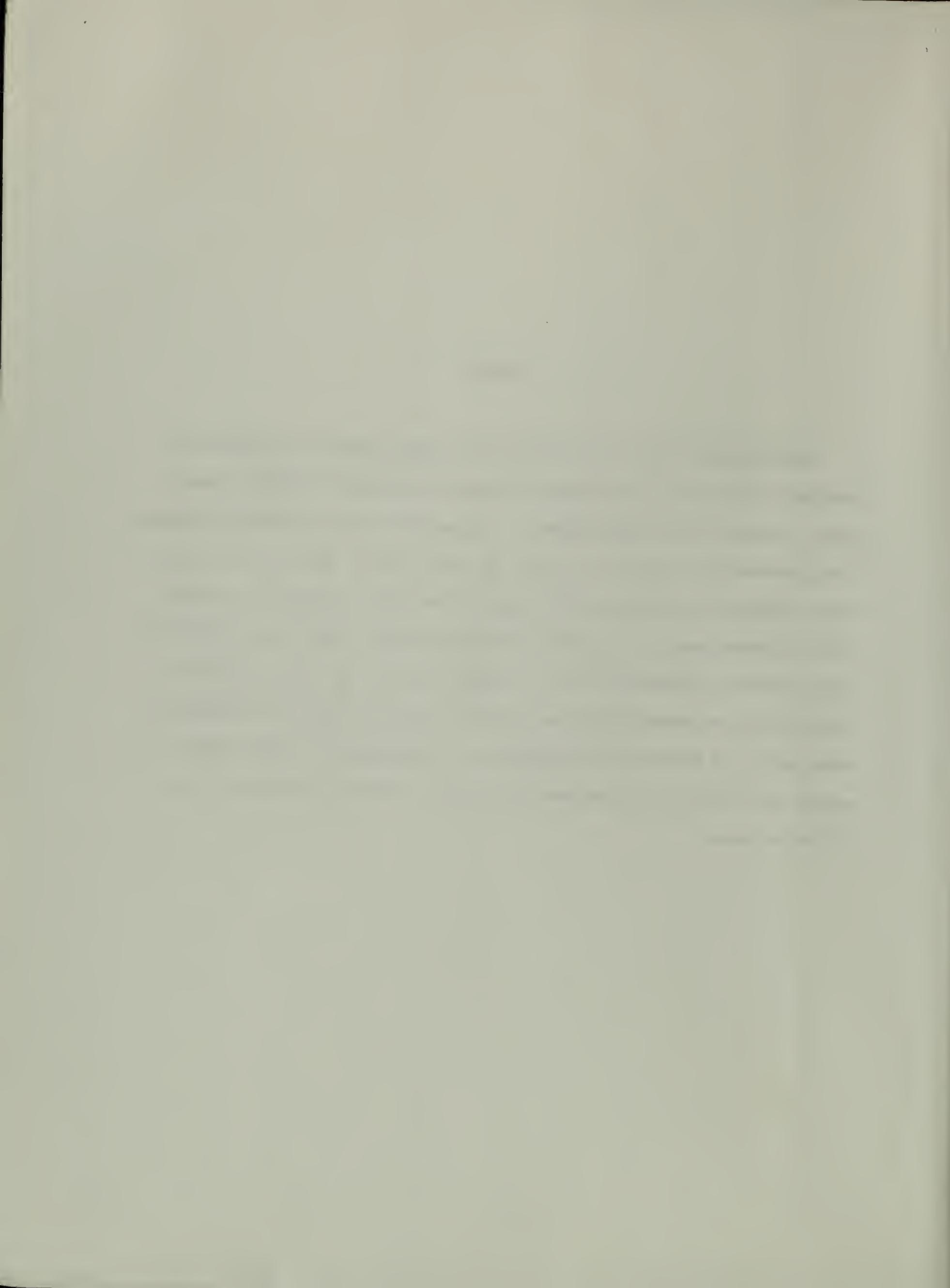
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PURPOSE

The Department of Environmental Quality Engineering is charged with ensuring the quality of all waters of the Commonwealth including groundwater. Because 34% of Massachusetts' population derives its water supplies from groundwater, because 275 cities and towns out of 351 rely upon groundwater sources for drinking water, because the natural quality of groundwater in Massachusetts is generally good and potable water can be obtained from subsurface reserves in most locations in the State, and because natural factors and human activities can and in some instances have rendered water unfit for drinking, the Department of Environmental Quality Engineering has adopted the groundwater protection strategy described in the following pages.





I. PROBLEM STATEMENT

Long a somewhat neglected issue, the topic of groundwater protection and conservation began to emerge in the late 1970s as one of considerable significance in Massachusetts. While the Department has for a number of years recognized the importance of protecting groundwater supplies, only recently have funds been available on a sufficient scale to accomplish this in more than limited instances. Clean Water Act-funded work (particularly Section 208 Water Quality Planning Studies of Regional and State Planning Agencies), Safe Drinking Water Act Projects (including the Surface Impoundments Assessment) and similar environmental protection programs led to the realization that groundwater quality protection was one of the primary needs of the 1980s. Publication of the Special Legislative Commission on Water Supply's September 1979 report, Chemical Contamination, focussed attention of the general public on groundwater protection across the State.

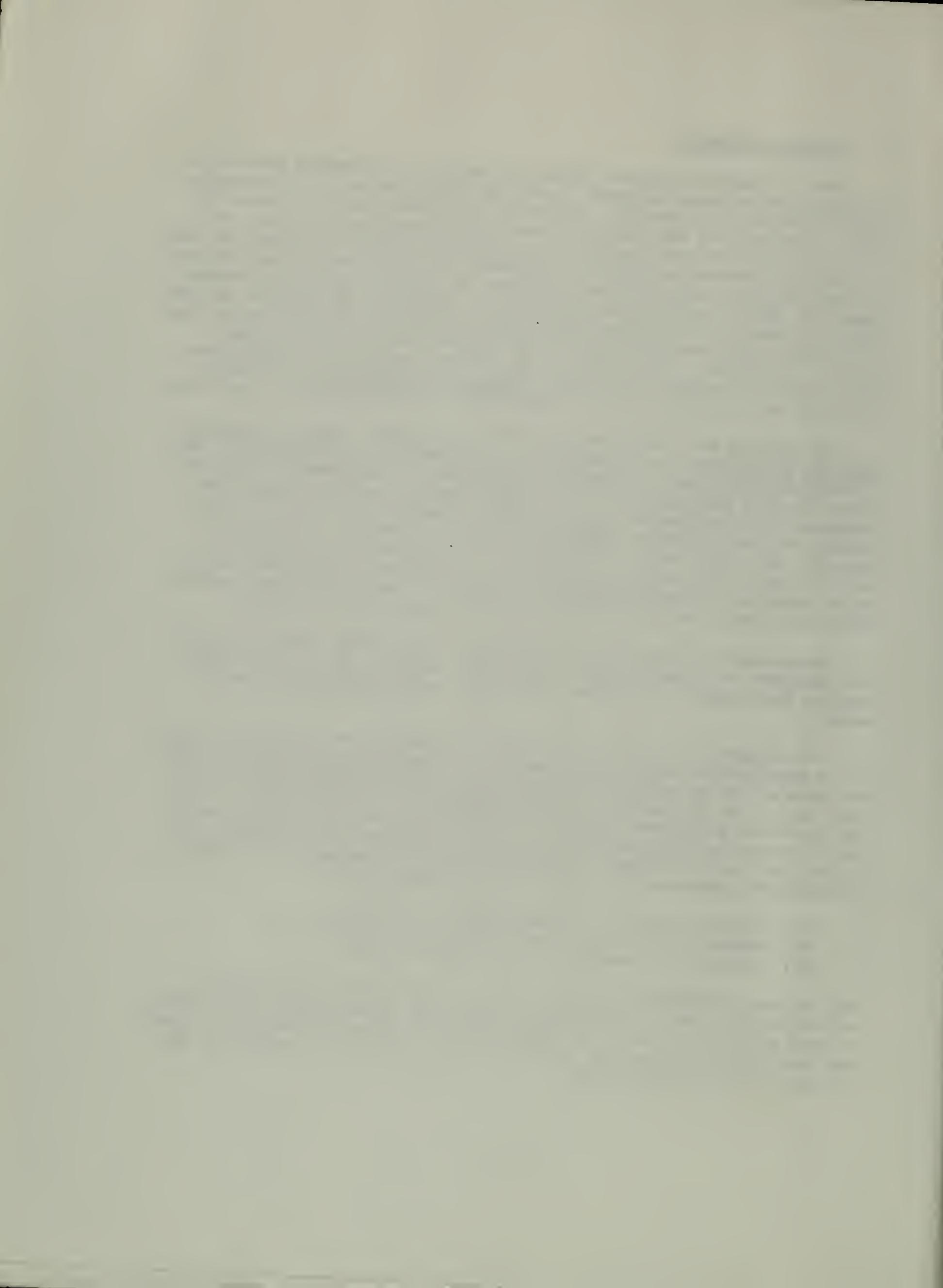
The impetus was continued in a conference, Water Supply and the Urbanizing Environment, co-sponsored by the University of Massachusetts and 12 other agencies and organizations, including the Department of Environmental Quality Engineering. Of the thirty papers presented, half were concerned with groundwater issues. DEQE's Commissioner Cortese, in his summary to the conference, stressed the need to develop a cooperative network, realizing that the most effective solutions to problems will occur at the local level; the emergence of hazardous waste topics as integral with water supply questions; the need to augment existing supplies; and protection of water supplies, particularly groundwater supplies.

Subsequent to that time, a wide array of activities and publications has developed as state, regional, and local agencies and private organizations have sought to describe, delineate, develop and protect groundwater.

Groundwater protection in the face of urbanization, industrialization, and a simultaneous need for more water is becoming a major problem. DEQE has been and is in the process of developing the tools necessary to meet that need. One of the first of these has been the development of a strategy to define groundwater problems in Massachusetts, the programs, skills and resources in the Department to meet the problem, and the needs perceived for future actions to protect groundwater supplies. This strategy outlines the comprehensive management issues necessary to:

- (A) Support continued, organized data gathering;
- (B) Analyze laws and policies related to groundwater; and
- (C) Implement preventative and remedial actions.

The strategy framework presented in the following pages is intended to assist the Department in refining its policies for groundwater protection to work in concert with the Commonwealth's 351 cities and towns to protect the water supplies essential to their citizens and to the industries and activities which support them.



II. GROUNDWATER MANAGEMENT AND PROTECTION GOAL

In 1980, the Massachusetts Water Resources Commission adopted a goal for groundwater protection. This goal, "to protect the quality and quantity of groundwaters to the levels necessary for projected future use", is the foundation for the development of groundwater protection programs and actions in Massachusetts. The Department of Environmental Quality Engineering (DEQE) is now pursuing the following operational goal in order to implement its part of this overall protection mandate:

THE DEPARTMENT WILL DEVELOP A PROGRAM TO PREVENT GROUND-WATERS FROM BEING DEGRADED TO A QUALITY BELOW ITS INTENDED USE, AND TO MANAGE CASES OF KNOWN OR SUSPECTED CONTAMINATION TO REDUCE THE IMPACT OF THE CONTAMINATION TO LEVELS CONSISTENT WITH ITS INTENDED USE, GIVEN PUBLIC HEALTH, ECONOMIC, AND TECHNICAL CONSTRAINTS.

This operational goal is being achieved through the DEQE programs and activities outlined in the following pages. These programs will meet the objectives summarized in Section III.

III. GROUNDWATER MANAGEMENT AND PROTECTION OBJECTIVES

This groundwater protection strategy is based upon a number of objectives, summarized below. These in turn are founded upon a number of presuppositions. Those assumptions are presented in Section IV. The objectives are:

- To identify existing groundwater resource evaluation data in Massachusetts.
- To document past and present groundwater programs and activities.
- To evaluate current groundwater programs and activities and their effectiveness in protecting groundwater for intended uses.
- To document legislative, organizational and resource needs to implement the DEQE groundwater operational goal.
- To develop new activities necessary to protect groundwater.
- To develop appropriate mechanisms to use in mitigating the effect of groundwater contamination.
- To develop a responsive informational and technical assistance program.
- To coordinate groundwater management and protection efforts in Massachusetts to ensure information exchange and to eliminate duplication of effort.

IV. GROUNDWATER MANAGEMENT AND PROTECTION STRATEGY ASSUMPTIONS

The groundwater management and protection strategy is based upon a number of premises or assumptions. It is important to state them explicitly so there can be a common understanding of the various activities now being undertaken as part of the Commonwealth's groundwater protection program.

The major working principles upon which this strategy is based are:

1. Groundwater threats can not be controlled quickly; the effort to develop a comprehensive protection program will be a long-term process.
2. The strategy will not be able to identify all long-term priorities and policies; it provides a framework and a process for initiating programs now and for making other decisions at the appropriate time in the future. There will never be a time when all the answers are available. The ultimate groundwater program will never be completed. The planning process will continue.
3. Coordination at all levels of government (Federal, State, regional, and local) is essential to the success of the groundwater protection strategy. The problem is complex and institutions dealing with activities affecting groundwater are many.
4. The quantity and quality of groundwater and surface water are closely linked. Any efforts to protect or enhance quality will have to be coordinated with the activities of the Commonwealth and with federal agencies in managing the quantity of groundwater use in order to ensure an adequate supply of good quality water. Groundwater management must be coordinated with surface water quality management programs, for the same reason.
5. Setting up a framework of institutional relationships and programs for further groundwater protection will take time and information. To support the process, order must be assigned to the steps in gathering the needed scientific and engineering knowledge on groundwater contamination, assessment, enhancement, and protection.
6. State and Federal resources available for groundwater issues are limited. It is important to phase a strategy over time and to encourage the use of resources on the highest priority groundwater needs in each state. Criteria to consider include determination of the most vulnerable and needed groundwaters, toxicity of contaminants, severity of risk from polluting activities, and manageability of the problems.

7. The strategy should encourage new and innovative approaches to groundwater protection through (for example) engineering modifications to reduce pollutant volumes, product substitution, increased recycling, and treatment techniques prior to disposal. It should also encourage innovative legal and institutional approaches to groundwater quality management.
8. Existing authorities appear adequate to initiate the strategy and to begin to provide increased groundwater protection. Legislative changes may ultimately be necessary, but sound and specific proposals can best be determined after more data and experience have been gained.

We have assumed that most of our groundwater is primarily of drinking water quality. However, groundwater is increasingly threatened by a variety of land use activities. Due to the extremely high cost of restoring contaminated waters to drinkable quality, prevention of pollution rather than subsequent restoration seems the only practical course to protect the Commonwealth's groundwater. Since almost all groundwater pollution is directly related to land use activities, controlling and monitoring these activities appears to be the most logical approach to preventing and/or controlling contamination.

Our strategy recognizes that certain activities do and will degrade groundwater quality and that a nondegradation policy is not possible everywhere even with best available technology. Therefore, a process must be established to enable the public and state agencies to make appropriate decisions regarding the siting and cleanup of those polluting activities; for example, wastewater treatment plants that discharge to the land must designate affected groundwater areas as Case III, for "uses other than drinking water".

Since potential threats to groundwater are increasing daily, groundwater protection programs must be given a high priority for implementation. Due to limitations imposed on us by the lack of data of programs and of financial resources, our initial strategy should not be to develop a detailed new program covering all aspects of groundwater protection. Instead, we must use groundwater elements of existing programs and provide for opportunities to amend them in the future as the "state-of-the-art" improves and additional resources become available.

The protection of groundwater must be accomplished initially through the coordination and administration of existing regulatory programs ("networking") to control activities which threaten groundwater. Programs include those federal programs for which administration has been delegated to the State, such as the Safe Drinking Water Act, the Clean Water Act and the Resource Conservation and Recovery Act. Implementation of the initial groundwater protection program will be accomplished using tools designed to achieve that objective. Existing tools include: best management practices, siting, design, construction, maintenance, performance, and monitoring criteria and standards. These tools are detailed in DEQE regulations such as the subsurface disposal regulations, wetland protection regulations, landfill regulations, drinking water regulations, and hazardous waste regulations.

Our strategy encourages local implementation of groundwater protection programs. Though some polluting activities can be controlled by existing state and federal programs, the strategy may require amendments to the statutes in order to enable cities and towns to amend bylaws to restrict or prohibit certain designated uses. We encourage and urge cities and towns to take full advantage of services offered by the regional planning agencies. For the most part, cities and towns have adequate authority to control a number of activities that have traditionally been under their jurisdiction. If local government fails to adequately protect groundwater, then state regulatory programs may have to be expanded to cover a wider range of activities.

V. GROUNDWATER PROGRAM ELEMENTS

The following program elements provide a more detailed picture of how the ultimate goal of "protecting the quality of groundwater to the levels necessary for potential uses" can be achieved.

A. Groundwater Resource Definition and Assessment

In order to assess the potential for contamination of ground and surface water supplies, DEQE has developed a Water Resources Atlas. The Atlas identifies wells, springs, and reservoirs serving more than 25 users. These are further defined by symbol as being in use, abandoned, contaminated, or reserved for future use. It locates and classifies both permitted and non-permitted sources of waste of varying degrees of contaminant severity: road salt storage areas, landfills, open dumps, surface impoundments, and hazardous waste sites. Both the Aquifer Information and Drainage Basins Overlays are taken directly from USGS information. The aquifer information provides well yield data (or, on Cape Cod, water table contours) from previously published Hydrologic Atlases (HA Series) at differing scales and using differing keys. The Drainage Basins have been transferred from recently completed maps showing major river basin divides and divides of all the basins of streams in the state draining an area of 2 to 5 square miles.

The obvious and most significant use of the maps will be to illustrate the relationship of existing or planned water supplies to known or possible sources of groundwater contamination, including the possibility of infiltrative pumping of contaminated surface water. These maps will aid in the prevention of some types of pollution simply by identifying particular activities as possible pollution sources. By use of the maps and associated data, it may be possible to track contamination incidents back to their sources.

The maps will materially assist water supply planning. By juxtaposing, at the same scale, anticipated reserves (potential water supply sources), present supplies, and known waste sites, attention may be focused upon areas most suited for water supply development. The maps will be used to prioritize water resource studies conducted by the Division of Water Resources in conjunction with the USGS. Conversely, they will also aid in proper siting of new waste storage, treatment, and disposal sites by indicating areas where they are least likely to affect useable water supplies. The maps may serve as a basis for the classification of groundwater by named stream basins.

These maps are by no means a substitute for detailed site evaluation by qualified hydrogeologists, but the maps do provide a valuable screening tool to focus limited time and funds. They present the best information available to the mappers and are subject to future revision as comment is received.

The overlays will be reproduced on transparent diazochrome polyester overlays and made available to interested parties.

Outputs Approximately one hundred eighty-eight USGS 7½ minute quadrangles (at a scale of 1:25,000) covering Massachusetts, in a set of four overlays for each quad: Water Sources, Waste Sources, Aquifer Information and Drainage Basins Overlays. November 1982 for DEQE use. Later (1983) for cities and towns. Revisions and updates will be made as appropriate.

Users' Handbook Report describing how to interpret and use the overlay maps. November 1982.

Paper: Groundwater Mapping - Development and use of overlay maps as an aid to statewide evaluation of potential groundwater problems in Massachusetts. June 29, 1982.

Paper: Development and Use of Map Overlays in Groundwater Protection. September 24, 1982.

B. Priority Evaluation System Development and Use

It is our strategy to develop a system for prioritizing sites with the potential for contaminating groundwater in Massachusetts. Methodologies for assessing the impacts of waste disposal sites on groundwater quality were reviewed. A Standardized System for Evaluating Waste Disposal Sites (developed by Harry E. LeGrand in 1980) is being considered as the most appropriate method to rank sites for groundwater contamination potential. The LeGrand System uses a step-by-step process to produce a standardized numerical rating of any site. Aquifer sensitivity and contaminant severity are both evaluated in this system.

Landfills, hazardous waste sites, surface impoundments, salt storage sheds and injection wells (as identified on our groundwater maps) are being evaluated by this system for their potential to contaminate surrounding water supplies. The sites will be prioritized for further attention by the numerical rating indicating sites of concern where further and more detailed studies should be conducted.

Each Division should be encouraged to streamline their activities through the use of priority evaluation systems. For example, the Division of Hazardous Waste uses the Mitre Corp. System to rank hazardous waste sites according to its potential air, surface and groundwater contamination, potential for direct human contact with hazardous waste on the site, and potential for fire or explosion.

Outputs - Adoption of the LeGrand System by appropriate DEQE agencies in their daily activities.

Paper: Testing of a standardized system for evaluating waste disposal and groundwater pollution in Massachusetts. LeGrand assessment of all waste disposal sites in Massachusetts is anticipated by January 1983.

C. Groundwater Monitoring

DEQE is currently in the process of developing a Comprehensive Monitoring Program. The project consists of: review of existing monitoring programs; review of regulatory requirements for groundwater monitoring; review of monitoring techniques; defining monitoring responsibilities of DEQE; and data management for groundwater monitoring.

To this date, groundwater monitoring programs have been carried out on a site-by-site basis with the responsibilities for sampling and testing (as well as designing the various monitoring systems and procedures) falling on different divisions, consultants, or individuals. Groundwater monitoring is a major component of most siting, abatement and control strategies. Groundwater monitoring has been, or will be, required in several Massachusetts water quality programs including: groundwater withdrawal and discharge permitting; landfill operations; the Safe Drinking Water Act; the Resource Conservation and Recovery Act; the Underground Injection Control Program; and, emergency response efforts.

The production of a groundwater monitoring handbook will identify the activities, responsibilities, and techniques related to groundwater monitoring in Massachusetts. It is hoped that it will help provide as standardized an approach as is practicable within the Department.

Output - Groundwater Monitoring Handbook, January 1983.

Paper: Development of the Massachusetts Groundwater Monitoring Program. September 23, 1982.

D. Hydrogeological Study Procedures

Procedures for hydrogeological studies must allow for variation in method due to the objectives of the study. Typical situations which may require a hydrogeological study include: potentially contaminating activities, current and past contamination incidents, water supply quantity and quality assurance and "special" or "academic studies". The scope of investigation for an individual project must reflect the purpose of the study and be cost effective. Procedural guidelines for minimum and special purpose requirements of hydrogeological studies would be of considerable use to the agents involved.

Hydrogeological studies are presently required by several laws and regulations, or may be requested where needed. Chapter 286 of the Acts of 1982 gives the DEQE broad authority to prevent and clean up public water supply contamination and underwrites it with a ten million dollar bond issue. This legislation appears to be the first such state action in the nation. The Department is currently developing a program to use those funds in clean-up work. One of the activities authorized is hydrogeologic studies. The Department is examining the best way to fund such work. Other specific federal, state and local agencies have responsibilities with regard to hydrogeologic investigations. These need to be identified and coordinated. The advice, counsel, and support of the U.S. EPA and the USGS will be sought for this work.

Outputs

- SEA Groundwater Issue Hydrologic Study item; report describing the various requirements of and for hydrogeologic studies in Massachusetts. June 1983.
- Regulations for Water Supply Contamination Correction Program (310 CMR 28). August 9, 1982.
- Work outline for Water Supply Contamination Correction Program. November 15, 1982.
- Site Investigation/Remedial Action Guidelines. August 1982.
- Division of Hazardous Waste Guidelines.

E. Agency Roles, Responsibilities and Coordination

As part of an agreement between the Commonwealth of Massachusetts and the U.S. EPA adopted in FY'81 and continued in FY'82, the U. S. EPA and Massachusetts DEQE have agreed to cooperate in an effort to improve the coordination of groundwater management and protection. To accomplish this, an inventory of Massachusetts groundwater related programs has been prepared. This document includes a description of the project, a listing of each output, and identification of a groundwater contact person for each regional, State and Federal agency. This allows for the evaluation of current programs, personnel and funding committed to groundwater projects in the Commonwealth.

A groundwater steering committee has been formed to develop policy recommendations and implementation strategies for groundwater management in the Commonwealth. This committee is comprised of one member from each agency involved in groundwater issues and five representatives of the public. This group acts as a technical advisory committee to any member agency, and is a standing committee of the Water Resources Commission.

In order to further ensure the exchange of information, a bi-monthly newsletter entitled The Groundwater Memo is circulated to all interested parties. This memo details current groundwater issues and agency publications.

Outputs - Groundwater Program Summaries, April 1982.

- Groundwater Memo, bi-monthly
- Groundwater Quality and Protection ... A Guide for Local Officials, Chapter 3. May 1982.

F. Identification of Groundwater Laws, Regulations and Policies

To strengthen the Groundwater Management and Protection Strategy it will be necessary to review existing and planned laws, regulations and policies which relate to groundwater. This analysis will summarize the current authority to protect and manage groundwater and allow for identification of areas where additional legislation and/or authority is necessary, and where there is need for new policy, for modification of policy, and for resolution of conflicting policies.

Output - Memoranda, topical papers, and reports describing existing legislation and identifying additional needs. September 1982.

G. Compliance and Enforcement

It is essential to document and evaluate current programs for an effective groundwater pollution compliance and enforcement approach. The use of compliance and enforcement to designate liability for groundwater contamination and responsibility for cleanup should be made uniform to ensure an effective approach to compliance-enforcement. The compliance and enforcement responsibilities of the legal staff, the Division of Hazardous Waste, Division of Water Pollution Control, the Division of Water Supply and the Division of Wetlands Protection will be evaluated and a document outlining a strategy for enforcing compliance with groundwater protection laws, regulations and permits will be produced.

Output - A document outlining DEQE strategy for ensuring compliance with State and Federal groundwater protection laws, regulations and permits. September 1983.

H. Facility Design, Siting, Treatment, Operation and Maintenance

Given the current absence of groundwater quality criteria and standards, each DEQE Division uses existing and/or proposed criteria and guidelines for the design, siting, operation and maintenance of facilities which have the potential to influence groundwater quality.

The following DEQE regulations directly or indirectly protect groundwater, surface water and drinking water supplies from contamination.

<u>Agency Title #</u>	<u>Chapter #</u>	<u>Agency</u>	<u>Regulation Title</u>
310 CMR	9,10,15,18, 19,22,24, 25,26,27, 28,30	DEQE	9-Administration of Waterway Licenses 10-Wetlands Protection Act 15-Minimum Requirements for the Subsurface Dis- posal of Sanitary Sewage 18-Installation, Operation, and Maintenance of Solid Waste Transfer Stations 19-The Disposal of Solid Wastes by Sanitary Landfill 22-Drinking Water Regula- tions 24-Water Pollution Control 25-State Grants for Drink- ing Water Filtration Plants 26-Leak Detection/System Rehabilitation-Water Supplies 27-Underground Water Source Protection 28-Water Supply Contamina- tion Correction Program 30-Phase I, Hazardous Waste Management Regulations
313 CMR	2,3	WRC	2-Management Planning Regulations 3-Water Well Registration
314 CMR	2,3,4,5,6, 7,8,9,30	DEQE/ DWPC	2-Rules for Adopting Ad- ministrative Regulations 3-Administrative Rules 4-Water Quality Standards 5-River Basin Classifications 6-Rules for the Prevention and Control of Oil Pollu- tion in the Waters of the Commonwealth 7-Operation of and Mainten- ance of Sewerage Systems and Waste Treatment Facilities 8-Sewer Extension and Connec- tion Permits 9-Certification for Dredging, Dredged Material Disposal and Fill in Waters 30-Hazardous Waste Management Regulations

Proposed Regulations

Regulation Being Revised:

310 CMR 19.0 The Disposal of Solid Wastes by Sanitary Landfill

New Regulations:

310 CMR 29.0 The Land Application of Non-hazardous Sludge
and Septage

310 CMR 30.0 Hazardous Waste Management Regulations (Phase II)

I. Groundwater Cleanup: Criteria, Procedures, and Financing

Groundwater contamination cleanup is funded under two programs. The newly formed Office of Incident Response, Assessment and Cleanup is responsible for the implementation of the Massachusetts Environmental Emergency Response Plan, which uses a "revolving fund" to provide funds for cleanup of spills of hydrocarbons and hazardous materials. The Division of Water Supply has been funded by a ten million dollar bond issue, to prevent and clean up contamination of public water supplies. Criteria need to be developed for consistent and rational decisions related to the level of cleanup which is appropriate in various situations. Definition of the cleanup procedures under various conditions should be produced. The circumstances under which the different programs are used to fund cleanup needs to be determined.

The Office of Incident Response, Assessment and Cleanup, within the Division of Hazardous Waste, and the Division of Water Supply together administer the public financing of cleanup operations in the Commonwealth. The Office of Incident Response, Assessment and Cleanup administers the Commonwealth's hazardous material revolving cleanup fund. Also, the Division of Hazardous Waste administers the State's hazardous waste program under RCRA and submits proposals for cleanup of sites under Superfund. The Division of Water Supply administers a \$10 million funding program for the cleanup of contaminated public water supplies.

Each of these programs provide for the funding of different groundwater contamination situations. Criteria and procedures for the operation of each program are contained in each Division.

Outputs

- Water Supply Contamination Correction Program Plan and Regulations. November 1982.
- A document defining the cleanup procedures to be used under various situations. July 1983.
- A document identifying existing and potential means to finance cleanup and emergency response operations. July 1983.

J. Public Information, Education, and Participation

The Department has a number of mechanisms to alert citizens to ground-water contamination. Various publications of the Public Affairs Office (PAO) of DEQE report contamination problems and serve as a source of factual information in the event of an inquiry. Each division has its own public information program. The Division of Hazardous Waste in addition has local Hazardous Waste Coordinators. A number of divisions also have reporting responsibilities associated with contamination incidents.

Input from the public is solicited throughout all of DEQE's ground-water related programs. Public participation is obtained through program related Task Forces or Advisory Committees. Assistance is requested from the public in siting of facilities and in promulgation of regulations through public meetings or hearings.

Education of the public concerning groundwater related issues occurs primarily through presentation of community training programs and through the preparation and distribution of a variety of topical handbooks, which are described in the last section of this strategy.

Information is disseminated formally through a bi-monthly newsletter, The Groundwater Memo, and occasional press releases of the Public Affairs Office.

Outputs are summarized in Section VII.

K. Research and Development

Primary responsibility for research and development in the Department is with the Office of Research and Standards. Research is conducted in the following offices.

DWPC's Research and Development Section is involved in a variety of groundwater-related projects, including hydrogeologic assessments of contaminated sites, plume definition, and evaluation of the effectiveness of land treatment of waste effluent. Depending upon other Departmental priorities, it is anticipated that there will be a need in the future for demonstration projects illustrating the transport of pollutants in, on, and below the water table and flow of groundwater through bedrock systems; for review of gasoline storage practices and associated problems; and for prototype studies on soil-groundwater-effluent interactions.

The Lawrence Experiment Station conducts a large number of analyses of samples, from SPOT testing for organic chemicals in public water supplies to trihalomethane analysis in water supplies of towns from ten to seventy-five thousand in population, to Safe Drinking Water Act-mandated tests and analyses of special samples. If the need for water supply testing increases at its present rate, additional laboratory facilities as well as the expansion of regional laboratories will be necessary in the near future; those needs should be determined.

The Office of Research and Standards and the Division of Water Pollution Control's Research and Development Section are in the process of being combined. The resulting office will be responsible for all of the research conducted by the Department.

If it is decided to develop numerical groundwater criteria and standards, all three of these units will become involved in that determination.

To a great extent, the work of each of these sections is presently driven by the needs of the programs of other parts of the agency.

Outputs - A wide variety of reports, memoranda, and criteria. See the publications list in Section VII.

L. Aquifer Protection Funding Program

Recent legislation (Chapter 286 of the Acts of 1982) has major impact on the protection of groundwater and aquifers in the State. The legislation authorizes DEQE to spend \$10 million to purchase lands, waters and easements to protect and conserve groundwater aquifers for future public water supply needs. The protection of high quality and quantity groundwater sources, through outright purchase of lands and recharge areas, to the purchase of development rights and land use controls, is the ultimate goal of this particular element and of the entire program.

Land purchase and land use control through this funding program is a major step in the process of implementing the overall groundwater management and protection goal of preventing groundwaters from becoming contaminated.

Outputs Grants to cities, towns and water districts to purchase lands and development rights over aquifers.

M. Groundwater Classification

DEQE and other state agencies have discussed various systems for the classification of groundwater. The Groundwater Steering Committee of the Water Resources Commission reviewed the classification systems of many other states and attempted to develop a system specific to Massachusetts.

The primary objectives of a groundwater classification system are: to serve as the basis for the protection of groundwaters to be used for a sensitive use (e.g., drinking water); and to serve as the basis to guide decisions on the location of potential contamination sources.

DEQE is currently classifying groundwater through its regulation of the siting of hazardous waste landfills and septic lagoons. The

The regulations and guidance state that these facilities can not be located over an actual, planned or potential underground drinking water source. Geologic deposits capable of yielding water greater than 100 gallons per minute are considered potential water sources. The 100 gallons per minute was chosen since it represents the approximate cost effective yield for a municipal water supply, and also because the USGS has maps delineating this area for most of the State.

The sanitary landfill regulations are currently under revision which include prohibition of the siting of landfills over "primary sand and gravel recharge areas of significant groundwater aquifers".

DEQE is concentrating on the siting of major facilities that we regulate. The objective of the siting criteria is the protection of high quantity and quality groundwater reserves.

The major item that is currently missing is a map delineating the general areas of actual, planned and potential underground drinking water sources. These maps will not be the absolute factor to determine the siting of a facility; rather they will act as a guide in the siting process.

Output - Additional overlay to the Groundwater Atlas delineating actual, planned and potential underground drinking water sources.

N. Groundwater Allocation (Withdrawal Permits)

The need to regulate the withdrawal of surface- and groundwater has been recognized as a necessary link in the overall groundwater protection program. Groundwater withdrawals should be regulated for the purposes of:

- the establishment of an accounting system for water budget analysis;
- monitoring and control over withdrawals that impact surface waters;
- determining the long-term withdrawal without negative quantity or quality effects on the groundwater resource;
- quality control from contamination sites;
- land use controls - siting decisions;
- drought prediction, control, management.

Current legislative initiatives recognize the need for a more formal system of water supply allocation. Normal DEQE well approvals are now focusing on the larger allocation issues. The Division of Water Supply is currently working closely with other state agencies to determine the need and direction for legislation to create a more formal allocation procedure.

VI. SUMMARY

The Department of Environmental Quality Engineering has developed a goal for groundwater management and protection. This is to "develop a program to prevent groundwaters from being degraded to a quality below its intended use and to manage cases of known or suspected contamination to reduce the impact of the contamination to levels consistent with its intended use, given public health, economic, and technical constraints". This very broad goal is mandated by the Department's enabling legislation, and activities in support of the goal are underway throughout DEQE, as described in Section V of the strategy summary. Program activities related to groundwater currently underway in the Department are recapitulated below:

- A. Groundwater Resource Definition and Assessment (development of a Water Resources Atlas).
- B. Priority Evaluation System Development and Use (development of a "triage system" to better focus limited resources on most severe problems).
- C. Groundwater Monitoring Program (evaluation and standardization of groundwater monitoring practices within the Department).
- D. Hydrogeological Study Procedures Review (analysis of hydrogeologic study methods and development of funding procedures and guidelines for such studies).
- E. Analysis of Agency Roles, Responsibilities, and Coordination (review and description of all Massachusetts groundwater-related programs).
- F. Identification of Groundwater Laws, Regulations, and Policies (review and analysis of all existing and proposed laws, regulations, and policies related to groundwater in Massachusetts, and identification of "gaps" and overlapping jurisdiction).
- G. Compliance and Enforcement Activities (standardization of compliance and enforcement procedures throughout groundwater-related divisions).
- H. Facility Design, Siting, Treatment, Operation, and Maintenance (review of criteria and guidance for facilities discharging to groundwater).
- I. Groundwater Clean-up (development of programs and criteria for consistent and rational decisions related to the level of clean-up in various situations).
- J. Public Information, Education, and Participation (coordination of groundwater-related issues in both presentation of information to citizens and in receiving information from them).

- K. Research and Development (groundwater testing, conduct of demonstration projects, and investigation of groundwater quality criteria and standards).
- L. Aquifer Protection Program (funding program for the purchase of land and development rights to protect potential and future groundwater supply sources).
- M. Groundwater Classification (define areas of special use and protection).
- N. Groundwater Allocation (develop withdrawal permit program).

Groundwater protection is now an issue "whose time has come". The General Court has been extremely supportive of the Department's groundwater programs, particularly in the passage of the recent comprehensive legislation in Chapter 286 of the Acts of 1982, which provides twenty million dollars in bond-issue funding for water supply clean-up and aquifer protection by land purchase among its many funded activities.

This strategy includes elements from all pertinent divisions of the Department, and applies to all divisions. Cooperation and participation from everyone in the Department is required to effectively implement this strategy. The Water Supply Planning and Development Section of the Division of Water Supply will be the lead agency in coordinating and monitoring progress of these activities and others which may arise from them in the future.

This strategy is not a static document, but forms the foundation of the Department of Environmental Quality Engineering's systematic and continuing identification of groundwater issues to be faced by the Department, and the allocation of means to address those issues. The strategy will therefore be updated as necessary, to reflect the contemporary condition of DEQE's involvement.

The Department anticipates that this strategy will provide the organizational framework necessary to identify and effectively and efficiently address matters which affect groundwater and the public health.

VII. LIST OF OUTPUTS

The strategy you have been reading has presented DEQE's approach to groundwater issues. To put this in some kind of perspective among other state agencies, groundwater publications and activities of DEQE are presented in boldface type below, interspersed with known groundwater publications of other agencies.

ANTICIPATED GROUNDWATER REPORTS 1980-1990

<u>SURFACE IMPOUNDMENTS ASSESSMENT REPORT (OPPM)</u>	11/1980
<u>AQUIFERS, LIQUID-WASTE IMPOUNDMENTS, AND MUNICIPAL WATER SUPPLY SOURCES (USGS/DWR & OPPM), USGS OFR 80-431</u>	11/1980
<u>MANAGEMENT FOR SITE INVESTIGATIONS (DHW)</u>	11/1980
Criteria for Evaluating Sites for Hazardous Waste Management (Clark-McGlennon Associates, NERCOM, and DEM/BSW)	11/1980
Decision Guide for Siting Acceptable Hazardous Waste Facilities in N.E. (Clark-McGlennon Associates, NERCOM, and DEM/BSW)	11/1980
<u>PROBABLE HIGH GROUNDWATER LEVELS ON CAPE COD (USGS/WRD and DWPC), USGS OFR 80-1008</u>	1980
<u>PROBABLE HIGH GROUNDWATER LEVELS IN MASSACHUSETTS (USGS/WRD and DWPC), USGS OFR 80-1205</u>	1980
PAMPHLETS: (DWPC Lakes Program) <u>YOUR SEPTIC SYSTEM AND YOUR LAKE</u> <u>DETERGENTS AND YOUR LAKE</u> <u>SEPTIC TANKS AND YOUR LAKE</u>	1980-1981
<u>GROUNDWATER MEMO (OPPM)</u>	1/81+ Bi-monthly
<u>GENERATING INSTITUTIONAL SUPPORT FOR A GROUNDWATER PROTECTION STRATEGY (OPPM)</u>	3/81
<u>ROAD SALTS AND WATER SUPPLIES (OPPM)</u>	8/81
Chemical Contamination in 1981 Update (Special Legislative Commission on Water Supply)	10/81
<u>UNDERGROUND WATER SOURCE PROTECTION IN MASSACHUSETTS - Handbook (DWS)</u>	11/81
<u>FEDERAL REGULATIONS FOR UWSPP AS REVISED TO 1981 - Compilation (DWS)</u>	11/81

<u>MANAGEMENT FOR SITE INVESTIGATIONS (DHW)</u>	11/81
Hazardous Waste Management in Massachusetts: Statewide EIR (DEM/BSW)	1981
<u>REPORT OF ROUTINE CHEMICAL AND PHYSICAL ANALYSES OF WATER SUPPLIES (DWS)</u>	1/82 (Annual)
<u>GEOLOGIC INFORMATION MATRIX (DWS)</u>	2/82
<u>INSTALLATION AND EVALUATION OF POROUS PAVEMENT (Northeastern University and DWPC)</u>	4/82
<u>GROUNDWATER PROGRAM SUMMARIES (OPPM)</u>	4/82
<u>GROUNDWATER PROTECTION SEMINARS (DWS, for DHW)</u>	4/82
<u>GROUNDWATER QUALITY AND PROTECTION ... A GUIDE ✓ FOR LOCAL OFFICIALS (DWS)</u>	5/82
<u>GROUNDWATER COURSE FOR DEQE STAFF (DWS)</u>	5/82
<u>SUMMARY OF GROUNDWATER QUALITY ("305 B" Report) (DWPC)</u>	5/82
<u>DIAGNOSTIC SURVEY REPORTS: John's Pond, Mashpee, Big Alum Pond, Sturbridge (DWPC)</u>	5/82
<u>UNDERGROUND WATER SOURCE PROTECTION REGULATIONS (310 CMR 27) (DWS)</u>	5/82
<u>GROUNDWATER PROBLEM MAPPING: DEVELOPMENT AND USE OF OVERLAY MAPS (DWS)</u>	6/82
<u>TESTING OF A STANDARDIZED SYSTEM FOR EVALUATING WASTE DISPOSAL AND GROUNDWATER POLLUTION IN MASSACHUSETTS (DWS)</u>	6/82
<u>WATER SUPPLY CONTAMINATION CORRECTION REGULATIONS (310 CMR 28) (DWS)</u>	7/82
<u>REVISED LANDFILL REGULATIONS (310 CMR 19) (DHW)</u>	7/82
<u>SITE INVESTIGATION/REMEDIAL ACTION GUIDELINES (DHW)</u>	8/82
<u>SOLUTE TRANSPORT MODELING, OTIS AFB (USGS/WRD AND DWPC)</u>	9/82
<u>GROUNDWATER LEGISLATION IN MASS. - Summary (DWS)</u>	9/82
<u>CURRENTS AND TRANSPORT OF PCB RESIDUES IN THE HOUSATONIC RIVER BASIN (USGS/DWR and DWPC)</u>	9/82
<u>DATA ON THE PCB RESIDUES IN SURFACE WATER AND GROUNDWATER ADJACENT IN THE HOUSATONIC RIVER (USGS)/DWR and DWPC)</u>	9/82

<u>WATER SUPPLY PROTECTION ATLAS HANDBOOK</u> (DWS)	11/82
<u>ENVIRONMENTAL EMERGENCY UPDATE</u> (DWPC)	1982
<u>CITIZEN INFORMATION PROCEDURES</u>	1/83
<u>FACILITY COMPLIANCE AND ENFORCEMENT STRATEGY</u>	1/83
<u>FINANCING CLEAN-UP OF GROUNDWATER</u> (OIR)	1/83
<u>GROUNDWATER ALLOCATION</u> (DWS)	1/83
Groundwater Assessment Studies Program ("ch. 800" Projects) (DEM/DWR)	1/83
<u>GROUNDWATER CLEAN-UP CRITERIA AND PROCEDURES</u> (OIR)	1/83
<u>GROUNDWATER MONITORING HANDBOOK</u> (DWS)	1/83
<u>GROUNDWATER QUALITY STANDARDS</u> (DWPC)	1/83
<u>LEGRAND ASSESSMENT OF WASTE DISPOSAL SITES</u>	1/83
<u>REPORT OF ROUTINE CHEMICAL AND PHYSICAL ANALYSES</u> <u>OF PUBLIC WATER SUPPLIES</u> (DWPC)	1/83
Sudbury River Water Supply Use, EIR (MDC)	1/83
<u>HYDROGEOLOGIC STUDY REQUIREMENTS IN MASSACHUSETTS:</u> <u>A REPORT</u> (DWS)	6/83
<u>WATER RESOURCES OF THE FRENCH AND QUINNEBAUG</u> <u>RIVER BASINS</u> (USGS/WRD and DWPC)	6/83
<u>ANNUAL GROUNDWATER STRATEGY UPDATE</u> (DWS)	6/83
Effectiveness of Drainage Features for Pollution Control Upon Groundwater. Initial Study. (DPW)	7/83
<u>AQUIFER PROTECTION REGULATION</u> (310 CMR 29.00) (DWS)	7/83
<u>UNDERGROUND INJECTION - CLASS V WELL REGULATORY</u> <u>NEEDS ASSESSMENT</u> (DWS)	9/84
<u>HAMPDEN WATER CONSERVATION PROJECT - Waterless</u> <u>Toilet Testing</u> (DWPC/Mass. Audubon)	10/84
Effectiveness of Drainage Features for Water Pollution Control Upon Groundwater - Phase I, Monitoring Wells (DPW)	1985
Effectiveness of Drainage Features for Water Pollution Control Upon Groundwater - Final Report, Users' Manual (DPW)	1990

